MULTI-SCALE WAVES IN SOUND-PROOF GLOBAL SIMULATIONS WITH EULAG

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EULAG is a computational model for simulating flows across a wide range of scales and physical scenarios. The standard option for EULAG employs an anelastic approximation to capture nonhydrostatic effects and simultaneously filter sound waves from the solution. The model advects potential temperature perturbation and treats the advective derivative of the environmental state as an implicit forcing on the RHS of the entropy equation – features that enhance computational stability and accuracy. The default configuration of EULAG uses MPDATA as an Eulerian solver coupled with implicit large eddy simulation (ILES) for turbulence – a combination recognized as a high resolution solver. Together all these features act to enhance EULAG's multiscale wave interaction capability.

Early global applications of EULAG tested it with idealized Held-Suarez (HS) climates. Results compared favorably with those previously published. Also within the HS context, EULAG was demonstrated to readily capture orographic waves over an idealized (very high yet narrow) Andes mountain range. The present paper will highlight recent work examining gravity wave packets arising from baroclinic and barotropic instabilities associated with frontal collapse/jet oscillations in idealized HS climates. The effects of global resolutions ranging from 2.8 to 0.7 degrees will be demonstrated. Sufficiently resolved EULAG simulations show a spectrum of gravity wave packets, ranging from larger scale inertio gravity waves to pure internal waves small enough that coriolis effects are negligible and nonhydrostatic accelerations are measurable.

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